

IGARSS 2001 ABSTRACT

Title Dr. **Family Name** Crippen

Given Name Robert

Institution Jet Propulsion Laboratory

Address 4800 Oak Grove Drive MS 300-233

Pasadena, California

Country USA **Post Code** 91109 **Phone No.** 1-818-354-2475

Fax No. 1-818-354-9476 **Email Address** Robert.E.Crippen@JPL.NASA.GOV

Presentation Preference: Oral

Preferred topic number: A1 (SRTM Special Session)

Abstract title: **Three-Dimensional Visualization Methodologies for
Desktop Analysis of SRTM Data**

Name of author(s): Robert E. Crippen

Corresponding author: Robert E. Crippen

Abstract:

The near-global digital elevation model (DEM) being produced by the Shuttle Radar Topography Mission (SRTM) opens numerous new research opportunities. One such opportunity is geomorphic analysis for the production of improved regional, and ultimately global, neotectonic maps. Such analyses will require methods to study the elevation model that maximally reveal landform features. This presentation discusses various concepts and procedures applicable to achieving this goal.

Stereoscopic viewing of the DEM is essential. This can be achieved with very simple software and little or no special hardware (stereoscopes, anaglyph glasses, or nothing at all). The input "image" is a shaded relief depiction of the DEM itself, created from a gradient filter. This is simpler *and preferable* to images generated to simulate natural lighting, which may hide features in shadows. The DEM is then used to "warp" the shade image into a stereo pair of perspectives. Basically this involves shifting pixels as a function of their height, left for the right-eye image and right for the left-eye image.

Stereo pairs can be printed and then viewed with stereoscopes, but this is costly, cumbersome, and allows little viewer control. Instead, on screen viewing facilitates image roaming, zooming, and quick adjustments to vertical exaggeration. Stereo images can be viewed in side-by-side display windows with parallel vision or cross-eyed viewing. Roaming and zooming is easier, however, with a single image display created as an

anaglyph in which the two perspectives are registered, one is displayed in red, the other is displayed in blue, and the viewer wears red-blue anaglyph glasses.

The shaded relief image, derived from the DEM itself, can be replaced with satellite or orthorectified aerial imagery. Advantages of this include (1) the introduction of land cover information, perhaps in multispectral color, which may help reveal geomorphic processes, and (2) the extension of topographic detail to scales finer than that provided by the DEM. The depth cues of “shape from shading” and “stereoscopic depth” become somewhat perceptually convolved and indistinguishable at the finer scales of such displays, which can be beneficial. This may be particularly significant if SRTM data are not fully accessible at their highest resolution.